TITLE OF INVENTION:

001 PRISMATIC BORESIGHTER

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CROSS REFERENCE TO RELATED PATENT APPLICATIONS:

003 Priority benefit claimed under 35 USC 119(e)
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STATEMENT OF FEDERALLY SPONSERED RESEARCH OR DEVELOPMENT:

004 Not Applicable

REFERENCE TO SEQUENTIAL LISTING:

005 Not applicable

BACKGROUND TO THE INVENTION

006 The present invention relates to bore sight collimators that are used to align a sight with the bore of a gun.

007 At present an optical boresighter uses an optical collimating system consisting of a lens that is optically aligned with a reticule marked on a glass plate, positioned at the focal plane of the lens. The lens and the reticule plate are mounted at either end of a housing.

008 The alignment of the collimator housing to the bore of the gun is achieved by use of a close fitting pin inserted into the end of the barrel, to which the collimator housing is clamped. Alternatively a magnetic strip is built into to the collimator housing, such that the collimator can be attached to the end of a gun barrel magnetically. The end of the barrel is by necessity, square with the bore, and this gives the necessary alignment.

009 In both these systems the optical element of the collimator is relatively large, it is similar to, or larger in size, to the objective lens of a riflescope. When the collimator is viewed with a riflescope, only the collimator reticule and the riflescope cross wires can be seen.

010 A large aperture of the optical element requires the optical path length to be long and consequently the collimator housing is large.

To prevent internal fogging, the void between the lens and the reticule plate is usually filled with dry Nitrogen gas, and the housing is usually of metal construction to contain the gas, which results in a relatively heavy unit.

BRIEF SUMMARY OF THE INVENTION

011 It is the object of this invention to provide a substantially smaller, lightweight and fog-proof collimator system, that has benefits and improved performance over other available systems as described.

012 The present invention is an optical collimator device for use in aligning a riflescope with the bore of a rifle. The construction is designed with a prismatic element between the magnifying lens and the reticule. It uses the prismatic element to fold the optical path length to make the system compact, and uses a magnetic strip to attach the collimator to the muzzle of a rifle barrel, allowing vertical height adjustment for various sight designs.

013 The optical design provides a much smaller lens and an increased focal length to lens aperture ratio, this ratio is typically greater than 6, where as alternative systems use a ratio of typically 3, so that when the design is used with a magnifying riflescope, the design allows the simultaneous viewing of the target and the reticule pattern in conjunction with the riflescope cross wires.

014 The ability to see the target with the reticule pattern image is of great benefit to the user, as the point of impact on the target can be seen with the reticule pattern, and allows the sight cross wires to be adjusted to the point of impact, while the reticule pattern is still centred on the target. This allows one shot zeroing, which is not possible with other systems.

015 The reticule can also be used a range scale for distance calculation and direct measurement of bullet drop and placement.

016 The use of a much smaller aperture lens (approximately one quarter of a standard design) with double the normal focal length gives better optical performance, as the placement of the reticule at the lens focal plane is not as critical as other systems, and spherical and chromatic aberrations are dramatically reduced, and the use of an achromatic lens design, which is a standard requirement on other systems, is no longer required. This dramatically reduces production costs.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

017 Figure 1A back view of present invention.

Figure 1B side view of present invention.

Figure 1C front view of present invention.

Figure 2A side view of present invention mounted on rifle.

Figure 2B enlarged side view of present invention mounted on rifle.

Figure 3A front view of present invention mounted on rifle seen through a telescopic sight.

Figure 3B front view of present invention mounted on rifle seen through a telescopic sight.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

018 According to the present invention there is provided an optical collimator device with a reticule pattern placed optically at infinity, characterised in that a magnifying optical element is placed in front of it along the optical path to enable the reticule pattern to be seen with the naked eye.

019 The optical path between the reticule pattern and the magnifying optic is transmitted through a block of optically transparent material forming a rhomboid prism. The optical path is aligned by internal reflecting surfaces at two positions so as to fold the optical path, the longer part of the optical path is arranged to be perpendicular to the barrel of the rifle forming a compact arrangement.

020 There is also provided a magnetic strip that enables the mounting of the device onto the muzzle of a barrel, permitting vertical adjustment of the collimator. The magnetic strip is directly mounted to the long section the prism for rigidity and compactness.

021 Figure 1B shows the glass reticule plate 4 with the marked reticule pattern is shown at 3, at the focal plane of the magnifying lens 2, and the optical path between them travels through a rhomboid prism 1. The optical path is reflected and turned at 90 degrees at the angled surfaces by prismatic internal reflection. The magnet 5 is fixed to the prism 1.

022 Figure 1C shows the image of the reticule pattern 3 as seen in the optic 2 when viewed in the direction of arrow A. The collimator 7, is shown with an optional protective cover.

023 Figure 2A shows the present invention 7 mounted on the muzzle of a rifle barrel 9. The riflescope 8 is viewed along sight line 10 and light rays from the target area 11 combine with rays 6 from the collimator 7, and enter the riflescope. Significantly, due to the optical design of the present invention, collimator 7, when a target is viewed with the magnifying riflescope 8, it is possible for multiple images to be seen.

024 Figure 2B shows an enlarged view showing light rays 11 from target area combining with light rays 6 travelling through the collimator 7.

025 Figure 3A shows a view as seen through the riflescope eyepiece 13, where the image of the target 14 is seen in conjunction with the collimator reticule image 3 and the cross wires 12 of the riflescope. This is of great benefit to the shooter as the combined view of the reticule pattern against the target makes adjusting the zero of the riflescope very simple to achieve.

026 The cross wires 12 are initially set centred on the reticule pattern 3. After a shot is fired at the centre of the target, the cross wires 12 are simply adjusted to the point of impact of the bullet 15, while the reticule pattern is held centred on the target. Figure 3B shows the cross wires moved to this position.

027 The reticule pattern can also be used to determine target range and to directly measure bullet drop at long ranges. This can be used to determine bullet muzzle velocity when these measurements are compared with exterior ballistic tables.

028 The range scale is not affected by the magnification of the riflescope as the target is also magnified by the same amount, and hence gives a true scale indication at any magnification.

029 Figure 3B shows an alternative view of the reticule pattern and riflescope cross wires. The riflescope cross wires12 are seen against the reticule pattern 3. This view can also be obtained by the present invention, if the riflescope is pointed away from the target, to something plain that has no features, such as the sky.

030 The position of the cross wires can be referenced against a range card which has a copy of the reticule pattern marked on it, with the required cross wire setting marked for a particular range.